

Claims

1. A method of welding together two metal work-pieces, the method including the following steps:

5 providing two metal work-pieces,
preparing a portion of each work-piece, the preparation including the performance of a surface treatment, including a friction stir welding process, that results in a region extending from the exterior surface into the work-piece having
10 a grain structure that is finer than the grain structure of the work-piece outside that region, and then
welding together the work-pieces by means of a fusion welding process that joins the respective prepared portions of the two work-pieces,
15 wherein said region extends into the work-piece to a depth that exceeds the depth of material that is caused to melt during the fusion welding process.

2. A method according to claim 1, wherein the surface treatment is conducted to a depth of at least 10mm into each work-piece and wherein the depth of the joint to be fusion welded is greater than 50mm.

3. A method according to claim 1, wherein the surface treatment is performed such that there is at least one cross-section in which the difference between the grain size number of the material in the work-piece outside the region that has been subjected to said surface treatment and the grain size number of the material in the work-piece inside the region is
30 greater than or equal to 4.

4. A method according to claim 1, wherein the step of preparing the work-pieces includes a step of treating or machining the surface-treated regions of each work-piece to

produce a surface on one work-piece that can be fusion welded to a corresponding surface on the other work-piece.

5. A method according to claim 1, wherein the fusion welding process is performed by means of an electron beam welding process.

6. A method according to claim 1, wherein the work-pieces are made from aluminium alloys.

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7. A method according to claim 1, wherein the work-pieces are made from cold-worked metal.

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8. A method according to claim 1, wherein the work-pieces are suitable for use in the manufacture of an aircraft component.

9. A method of welding together two work-pieces, the method including the following steps:

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providing two metal work-pieces,
friction stir welding a region of each work-piece,
preparing the friction stir welded regions of each work-piece to produce a surface on one work-piece that can be fusion welded to a corresponding surface on the other work-piece, and

fusion welding the respective prepared surfaces of the two work-pieces together, thereby joining the work-pieces.

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10. A method of welding together two metal work-pieces, the method including the following steps:

providing two metal work-pieces,
preparing a portion of each work-piece, the preparation including the performance of a surface treatment that results in a region extending from the exterior surface into the work-

piece having a grain structure that is finer than the grain structure of the work-piece outside that region, and

welding together the work-pieces by means of a fusion welding process that joins the respective prepared portions of
5 the two work-pieces,

wherein said region extends into the work-piece to a depth that exceeds the depth of material that is caused to melt during the fusion welding process.

10 11. A method according to claim 1, wherein the work-pieces, when welded together, form at least part of a block of metal, the method further including the step of manufacturing an aircraft component, wherein the aircraft component is machined from the block of metal.

15 12. A method according to claim 9, wherein the work-pieces, when joined, form at least part of a block of metal, the method further including the step of manufacturing an aircraft component, wherein the aircraft component is machined from the
20 block of metal.

13. A method according to claim 10, wherein the work-pieces, when welded together, form at least part of a block of metal, the method further including the step of manufacturing an aircraft component, wherein the aircraft component is machined from the block of metal.
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14. A method according to claim 1, wherein the method further includes a step of making an aircraft component from the work-pieces when welded together, and a step of manufacturing an aircraft including the aircraft component.
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15. A method according to claim 9, wherein the method further includes a step of making an aircraft component from the work-

pieces when welded together, and a step of manufacturing an aircraft including the aircraft component.

16. A method according to claim 10, wherein the method
5 further includes a step of making an aircraft component from
the work-pieces when welded together, and a step of
manufacturing an aircraft including the aircraft component.

17. A component comprising a weld joint joining one part of
10 the component to an adjacent part of the component, the
component in the region of the joint comprising a portion,
that has been fusion welded, sandwiched between two portions
that have each been friction stir welded prior to the
formation of the fusion welded portions.

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18. A component according to claim 17, wherein the component
is an aircraft component.

19. A component made from two work-pieces welded together in
20 accordance with the method as claimed in claim 1.

20. A component made from two work-pieces welded together in
accordance with the method as claimed in claim 9.

25 21. A component made from two work-pieces welded together in
accordance with the method as claimed in claim 10.